

REMARKS/ARGUMENTS

Claim Amendments

Claim 1 is amended to state that the cleaning events are performed generally periodically at a frequency of at least one cleaning event per week. This amendment is supported by page 9, lines 4-5; page 12, line 4; and, page 13, lines 5-21. Part (b) of claim 5 is amended to describe a membrane module and to clarify the flow of chemical cleaner as supported by page 6, lines 15-29 and page 9, line 25 to page 10, line 14 of the application. Claim 6 is amended to refer to cleaning events performed generally periodically at a frequency between 1 and 7 times per week. These amendments are supported as for the amendments made to claim 1. Claim 12 is amended to delete the references to upper limits of the pulse and waiting period duration. Claim 13 is amended to replace the reference to chemical cleaner adjacent the membranes to chemical cleaner in tank water adjacent the outsides of the membranes. This amendment is supported by page 10, line 21 to page 11, line 2. Claim 16 is amended to state that chemical cleaner is removed through a drain in the tank. This is supported by page 17, lines 8-11. Claim 17 is similarly amended. Claim 38 is amended to add that the water is replaced between steps (B)(b) and step B(c) of claim 1 which corresponds, in that respect, to claims 16 and 17 and is supported by page 7, lines 14 to 31; page 15, line 9; and, page 17, lines 8-13. The Applicants submit that no new matter is added by these amendments.

Claim Rejections – 35 USC 103

Claims 1-17 and 27-38 are pending. All pending claims were rejected as being obvious over Smith et al (US 5,403,479) in view of Applicants' alleged admissions of known prior art. The Applicants respectfully disagree with these rejections and submit that all claims, at least as amended, are allowable.

Regarding claim 1, the Office Action states that Figures 4 and 6 of Smith have one or more cleaning events per week. However, neither Figure shows cleaning

events, as defined in claim 1, performed generally periodically at a frequency of at least once a week between first cleanings as defined by the claims. Figure 4 in particular does not even have cleaning events performed generally periodically at any determinable frequency.

Regarding the CT ranges, the Office Action provides a set of references from Smith. The reporting of the first reference, to line 9 of a table, is incorrect. The table gives only a concentration, does not give a time and does not say how many times per week a dose of that concentration would be applied. The other citations similarly each describe only 1 parameter and are not linked by any teaching in Smith to choices of other parameters as would be required to find any disclosure in Smith of a weekly CT. Further, the concentrations extracted from Smith in the Office Action are not representative of the overall teaching in Smith even to that single parameter. In other places, Smith states a preference for higher concentrations of about 300 ppm OCL (435 mg/L NaOCl) (column 19, lines 6-25).

Regarding the combination of first cleanings and cleaning events in claim 1, the Office Action acknowledges that Smith does not teach such a combination. However, the Office Action also cites page 2, lines 6-7 of the specification. This reference describes a combination of "periodic regular cleaning" and intensive recovery cleaning. But "periodic regular cleaning" is defined in the immediately following page 2, lines 8-19 as being a backwash with air or water at sufficient force to physically push solids off of the membranes. This is not a cleaning event as defined by the claims. Similarly, in Smith column 9, lines 18-20, the back-flushing is with permeate (see line 2) which is also not a cleaning event as claimed by the Applicants. No other reference or combination of references cited in the Office Action provides *prima facie* evidence that a combination as claimed by the Applicants is obvious.

The Applicants submit that all other pending claims are similarly allowable for one or more reasons given in relation to claim 1 and further because the Office Action does not provide *prima facie* evidence that those claims are obvious or that the applications of *In re Boesch* or inherency doctrines are justified. However, some particular claims will be discussed in additional detail below.

Regarding claim 5 and its dependants, when Smith provides a "pulsed" flow, the biocidal fluid is recirculated, meaning that the biocidal solution is drawn from a tank, enters into one header, flows through the lumens of the fibers to the outer header, flows out of the other header and then back to the tank (column 17, lines 45-53). Smith does not teach a combination of pulsing and "dead end" flow. Such a combination would be against the teaching of Smith that (a) pulsing should avoid flow through open pores (column 17, lines 1-6) (b) pulsing should not cause hydraulic flow through the open pores of the membranes (column 16, lines 60-65), and (c) dead-end-ending of the fibers is not preferred (column 11, lines 62-63), and only desired in some instances (column 17, lines 53-56). Regarding claims 11, 12, 14 and 15, the pressures and times given in Smith at column 11, lines 25-47 are in relation to a recirculated flow only. There is also nothing to indicate that someone using a recirculating system as in Smith, and optimizing according to the stated purpose of pulsing as in Smith, would arrive at the additional elements of claims 11 and 12. Aside from the processes being different, the minimum pulse durations claimed by the Applicants are twice as long as the maximum taught by Smith which indicates against application of the *In re Boesch* doctrine.

Regarding claim 15, permeability of membranes is related to their average pore size and their porosity (density of pores). The application mentions pore sizes ranging from 0.003 to 10 microns (page 7, lines 3-7). Similarly, Smith refers to a range of pore sizes from 50 angstroms to 5 microns (column 11, lines 41-42). Thus pore sizes have at least two orders of magnitude of variation. Porosities for

a given pore size may also vary and Smith discusses pressures ranging from 0.1 psi to 100 psi, another 3 orders of magnitude of variation. Given these vast potential variations, the Applicants submit that the specific flows in claim 15 are not inherent in the Smith disclosure particularly since Smith is also recirculating the biocidal fluid which will alter the amount of biocidal fluid that flows through the membrane compared to a dead end flow.

Regarding claims 16 and 17, withdrawing the chemical cleaner from the lumens in Smith, column 12, lines 64-66, is not removal as retentate or removal through a drain in the tank.

Regarding claims 31 and 35, none of the cited references states that there is no agitation. In contrast, column 17, lines 7-56 of Smith describe that air is provided through a gas distribution means (lines 22-24) in Figure 2 which is configured to have a flow of biocidal solution through the membranes (lines 45-50). Agitation, as the word is used in the present application, includes aeration (page 8, lines 4-6).

Regarding claim 33, Smith does not teach 70% recovery of flux, but rather restoring flux after each cleaning procedure to at least 70% of an initial flux. Thus each application of the cleaning process in Smith is intended to meet or exceed the same, constant, goal. As shown in Figures 4 and 6, for example, later cleaning instances in Smith can produce fluxes exceeding those produced in earlier cleanings. In claim 33, the flux produced after a later cleaning event is less than the flux produced by a preceding cleaning event.

Regarding claim 36, introducing a chemical cleaner to flowing water is not "equivalent" to providing chemical cleaner in a tank. For example, Smith teaches recirculating the biocidal solution, the biocidal solution being drawn through the

tank, passed through the lumens of the membranes and returned to the tank. This recirculation would not work with the process of claim 36.

Regarding claim 38, the amendments make the statements in the Office Action about replacing water removed during permeation inapplicable. Smith also teaches against draining the tank (column 11, lines 24-25) and the Office Action does not provide prima facie evidence why a person skilled in the art who had any reason to drain a tank would want to use any process in Smith or be taught by Smith towards the Applicants' claimed process.

The Applicants submit that the further remarks in the "Response to Arguments" section of the Office Action do not provide prima facie evidence of obviousness nor otherwise detract from the patentability of the claims.

The Applicants further submit that the "Response to Arguments" section of the Advisory Action do not provide prima facie evidence of obviousness. In particular, the citation spanning pages 2-3 of the Advisory Action relate to dead end flow which is an alternative method to pulsed flow in Smith '479 and so not applicable to pulsed flow in Smith '479. Regarding optimizing the CT volume, Smith teaches that a system should be cleaned after it has fouled, for example so that its permeability has dropped by at least 20% (column 12, lines 43-46), and to restore permeability at each cleaning to above a selected percentage of an initial stable flux (column 18, lines 19-23) in a process not having a combination of first cleanings and cleaning events as described in either claim 1 or 27. Accordingly, optimizing the Smith process under the principal that more chemicals should be put in for dirtier water, does not make claims which include the CT values as an element obvious.

Appl. No. 09/425,234
Amdt. dated June 3, 2004
Reply to Office Action of February 17, 2004
and Advisory Action of May 5, 2004

For the reasons above, the Applicants submit that the claims are allowable.

Respectfully submitted,

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